

Autonomous Decentralized Coordination of Heterogeneous Unmanned Systems via Adaptive Auctions, Phase I

Completed Technology Project (2018 - 2019)



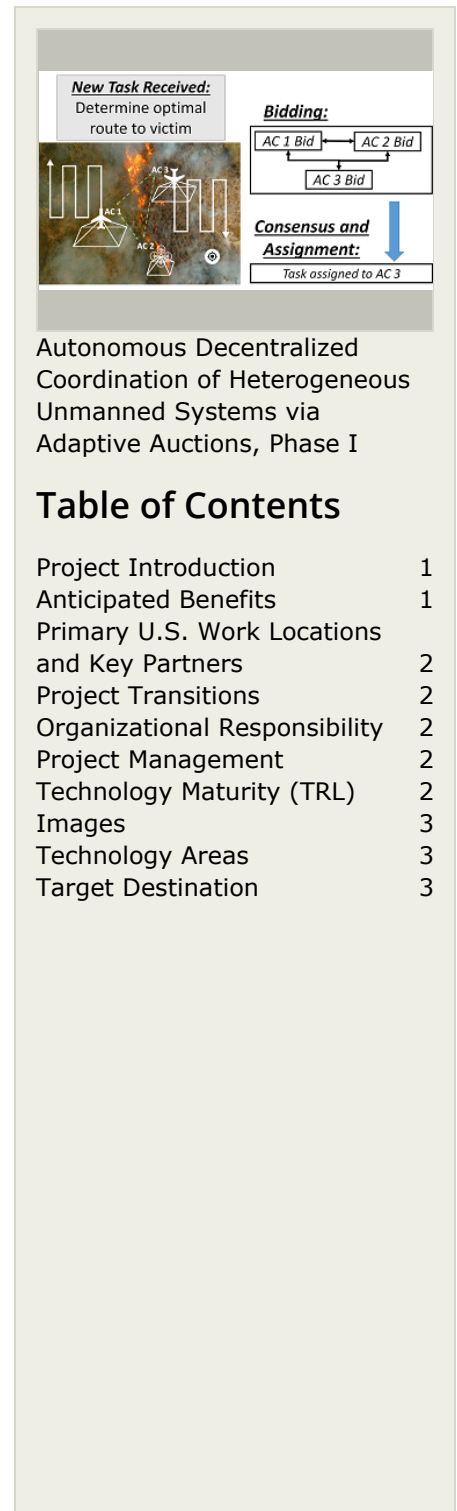
Project Introduction

As robotics and autonomous systems continue to rapidly evolve into highly advanced, multi-mission systems capable of manned-unmanned teaming efforts, opportunities to leverage practical real-world autonomous intervehicle coordination becomes feasible. Disaster relief efforts such as search and rescue are poised to take advantage of collaborating unmanned assets to provide risk reduction and necessary stand-off for first responders. Fully custom solutions are not necessary, as collaborative capabilities can be achieved by leveraging existing or emerging UAVs to perform the physical and cognitive tasks required. To achieve feasibility, Heron Systems proposes GLUE, a novel decentralized virtual auctioneer framework enabling autonomous resource and task allocation of coordinated, heterogeneous unmanned assets. Phase 1 work focuses on software algorithm research and development through conceptually demonstrating GLUE against key tasks that make up a search and rescue operation. Heron Systems will leverage its existing plug and play robotic architecture, the Multi-Agent Cooperative Engagement (MACE) framework, as a foundation for providing the necessary infrastructure to achieve a realistic SITL simulation environment. The proposed solution provides the necessary modularity ensuring robustness to future SoA advances in autonomy. This further provides an ability to remain vehicle agnostic enabling successful integration with a wide variety of COTS vehicles.

Anticipated Benefits

Heron Systems identifies the UAS National Air Space (NAS) integration project as the principle NASA mission to benefit from GLUE. Determining priorities among competing operational interests in a heterogeneous environment would substantially enhance the maturity and robustness of the UTM approach. GLUE would provide UTM with a framework for enabling safe terminal area operations via automated task management used to negotiate competing requirements in a manner that is safe for all parties.

Collaborative UAS capabilities enable game changing opportunities. DoD would benefit from small UAS packages where swarming enhances capability at low cost per agent. This could enable front-line ISR missions or even kinetic events in support of squad level operations. Surveying, mapping, inspection and tracking capabilities via multiple, specialized platforms generally benefit industry (energy, construction, mining, ag, etc.) as well as gov't (EPA, DHS, etc.).



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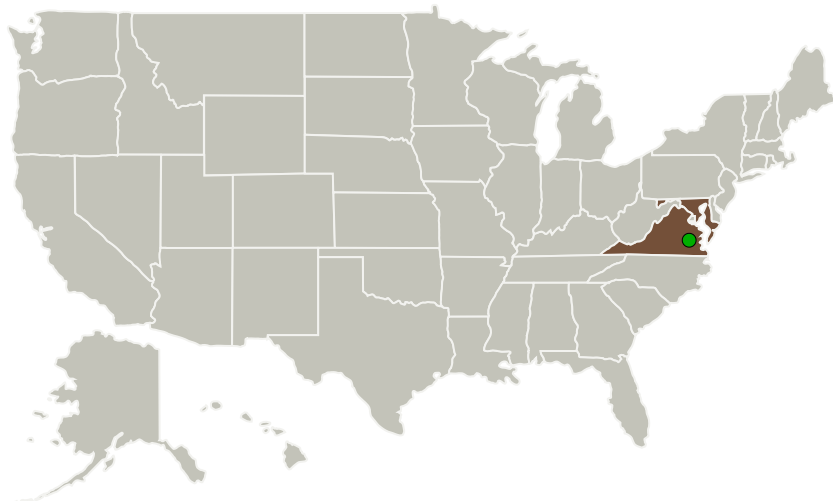
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Heron Systems, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	California, Maryland
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Maryland	Virginia
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Project Transitions

**July 2018:** Project Start**February 2019:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/141286>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Heron Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

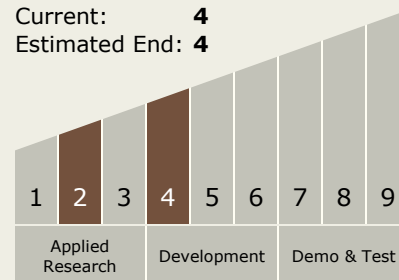
Carlos Torrez

Principal Investigator:

Kenneth Kroeger

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4

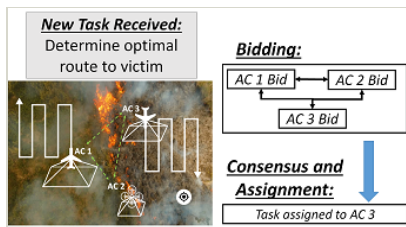


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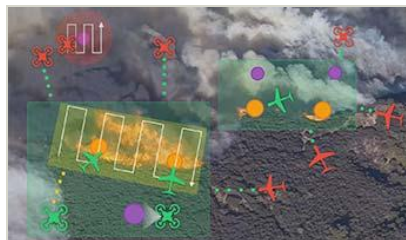


Images



Briefing Chart Image

Autonomous Decentralized Coordination of Heterogeneous Unmanned Systems via Adaptive Auctions, Phase I
(<https://techport.nasa.gov/image/136132>)



Final Summary Chart Image

Autonomous Decentralized Coordination of Heterogeneous Unmanned Systems via Adaptive Auctions, Phase I
(<https://techport.nasa.gov/image/137001>)

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.3 Aero Propulsion
 - └ TX01.3.2 Turbine Based Combined Cycle

Target Destination

Earth